Livewire Data Platform – A Solution for EEMS Data Sharing

Kay Kelly
National Renewable Energy Laboratory
6/11/2019

DOE Vehicle Technologies Program
2019 Annual Merit Review and Peer Evaluation Meeting

Project ID eems066

Overview

Timeline

- Project start date: 7/26/2018
- Project end date: 9/30/2021
  - Go/no-go at end of 2nd year
- Percent complete: 25%

Barriers

- Expansive community of relevant stakeholders
- Difficulty in sourcing empirical real-world data applicable to new mobility technologies, such as connectivity and automation

Budget

- Total project funding: $3M
  - DOE share: $3M
- Funding for Fiscal Year (FY) 2019: $1.5M
- Funding for FY 2020: $1.5M

Any proposed future work is subject to change based on funding levels.

Partners

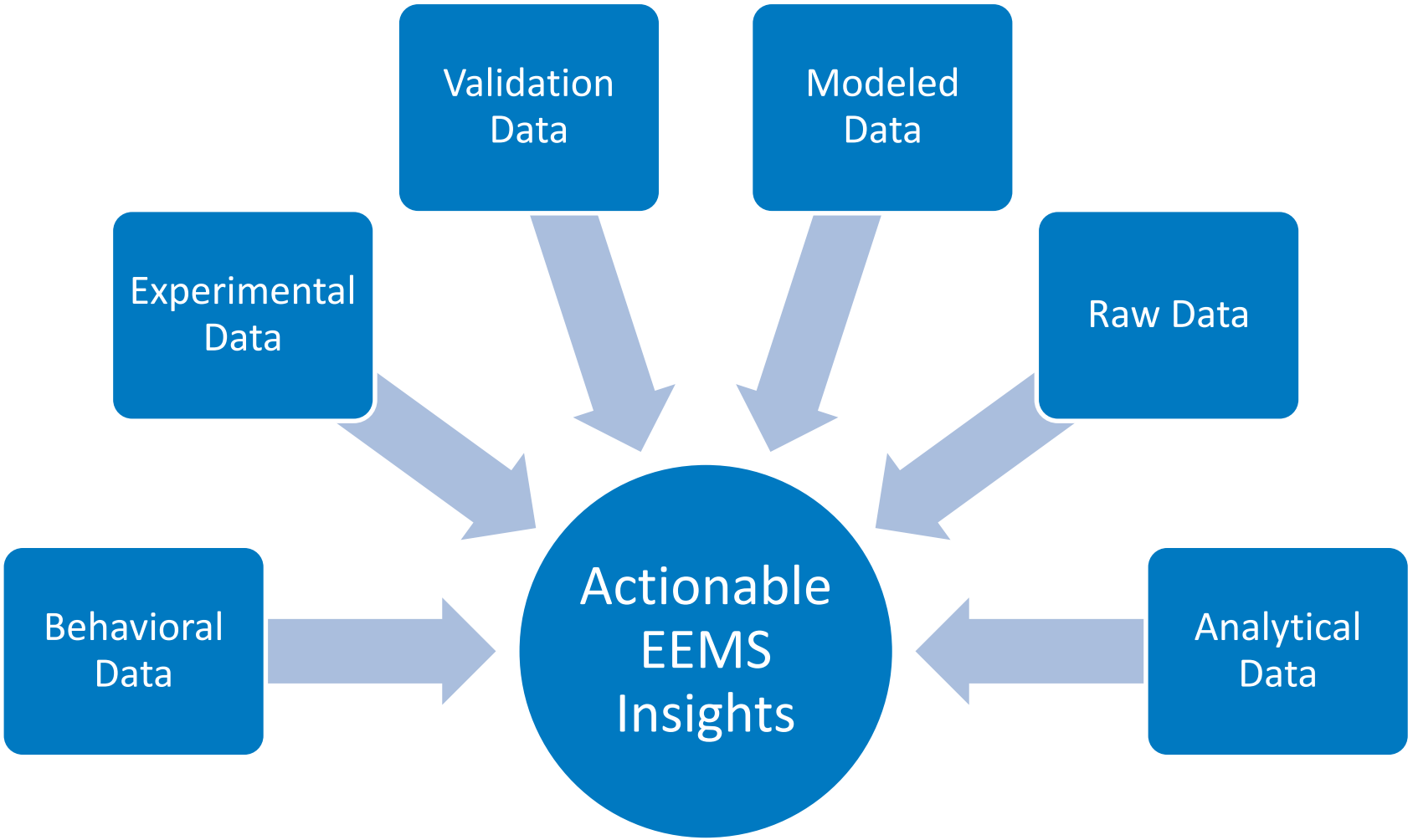
- Interactions/collaborations

Argonne National Laboratory (ANL), Lawrence Berkeley National Laboratory (LBNL), Oak Ridge National Laboratory (ORNL), Globus, VTO Technology Integration (TI) Living Laboratories

- Project leads

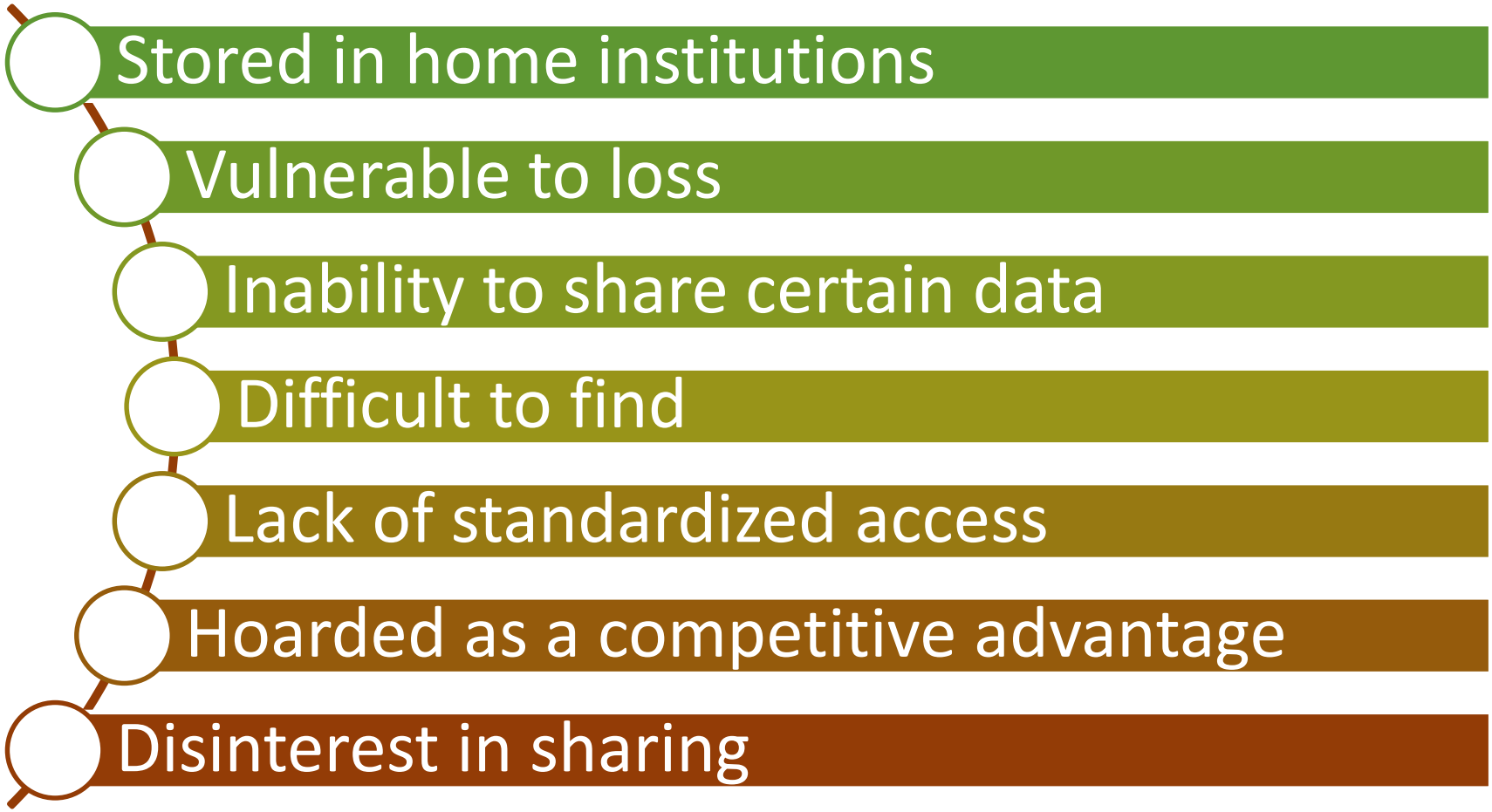
National Renewable Energy Laboratory (NREL), Pacific Northwest National Laboratory (PNNL), Idaho National Laboratory (INL)

Relevance – Data is a Critical Need for EEMS



To bring about fundamental changes in our transportation system, data sharing must be endemic.

Relevance – Historical Data Challenges



Goal: Remove barriers and give EEMS researchers the data they need to answer big transportation questions

Approach – Share EEMS Data

The Livewire Data Platform provides:

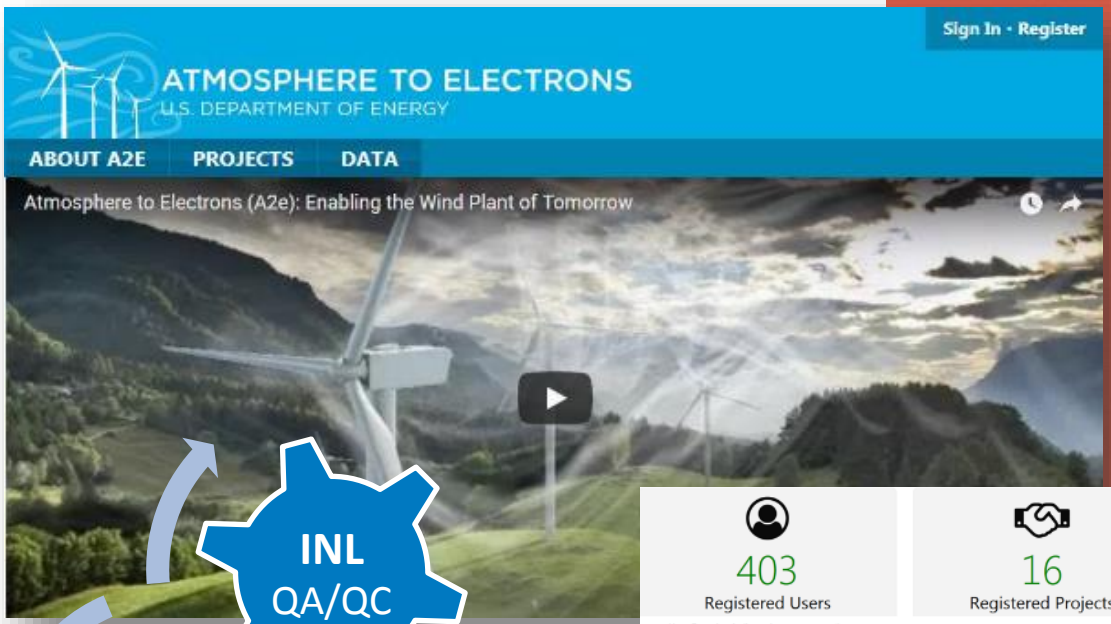
- A **platform** allowing easy and secure data-sharing and discovery using both human website and computer-accessible Application Programming Interface (API) formats
- A **community** building partnerships and collaboration rather than competition
- A **system** allowing shared data to grow in size and complexity as EEMS evolves

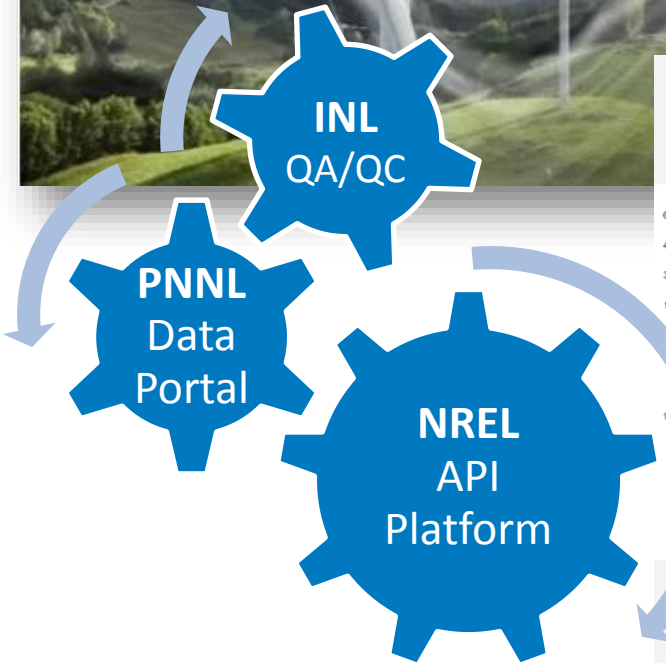
Milestone Name/Description	Deadline	Milestone Type
Develop beta Livewire platform and implement API platform, exposing at least 3 APIs	✓ 6/30/2019 On track	Quarterly Progress Measure
Implement first iteration of data catalog through the DataHUB including 10 datasets	✓ 9/30/2019 On track	Go/No-Go Milestone
Expose at least 9 APIs and catalog 20 datasets in total	9/30/2020	Go/No-Go Milestone

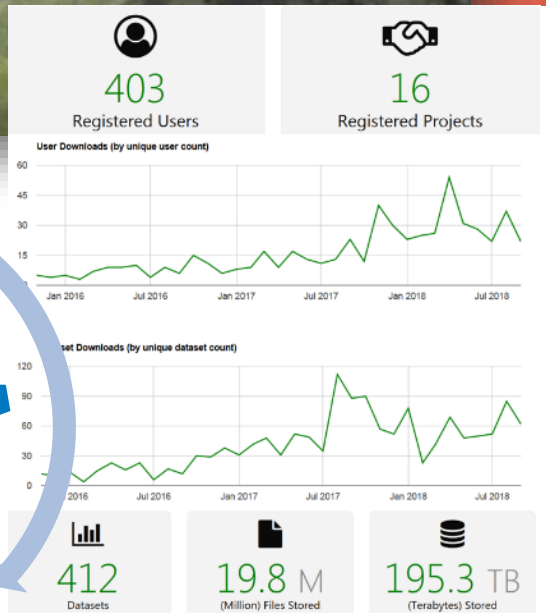
EEMS is the focus of this effort for FY 19, but other VTO programs have expressed interest for FY 20: the Combustion Consortium and TRUCK Consortium.

Approach – Leverage Existing Assets

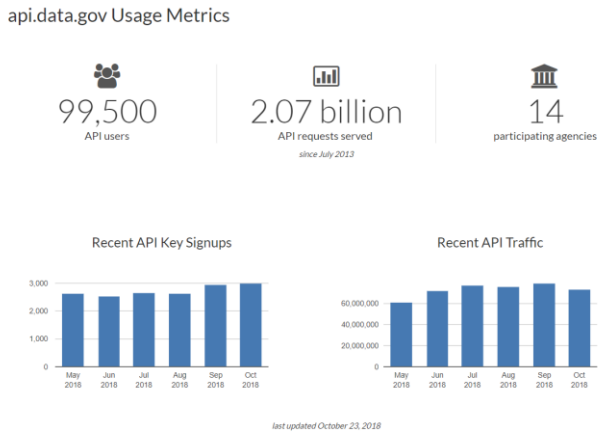
a2e.energy.gov



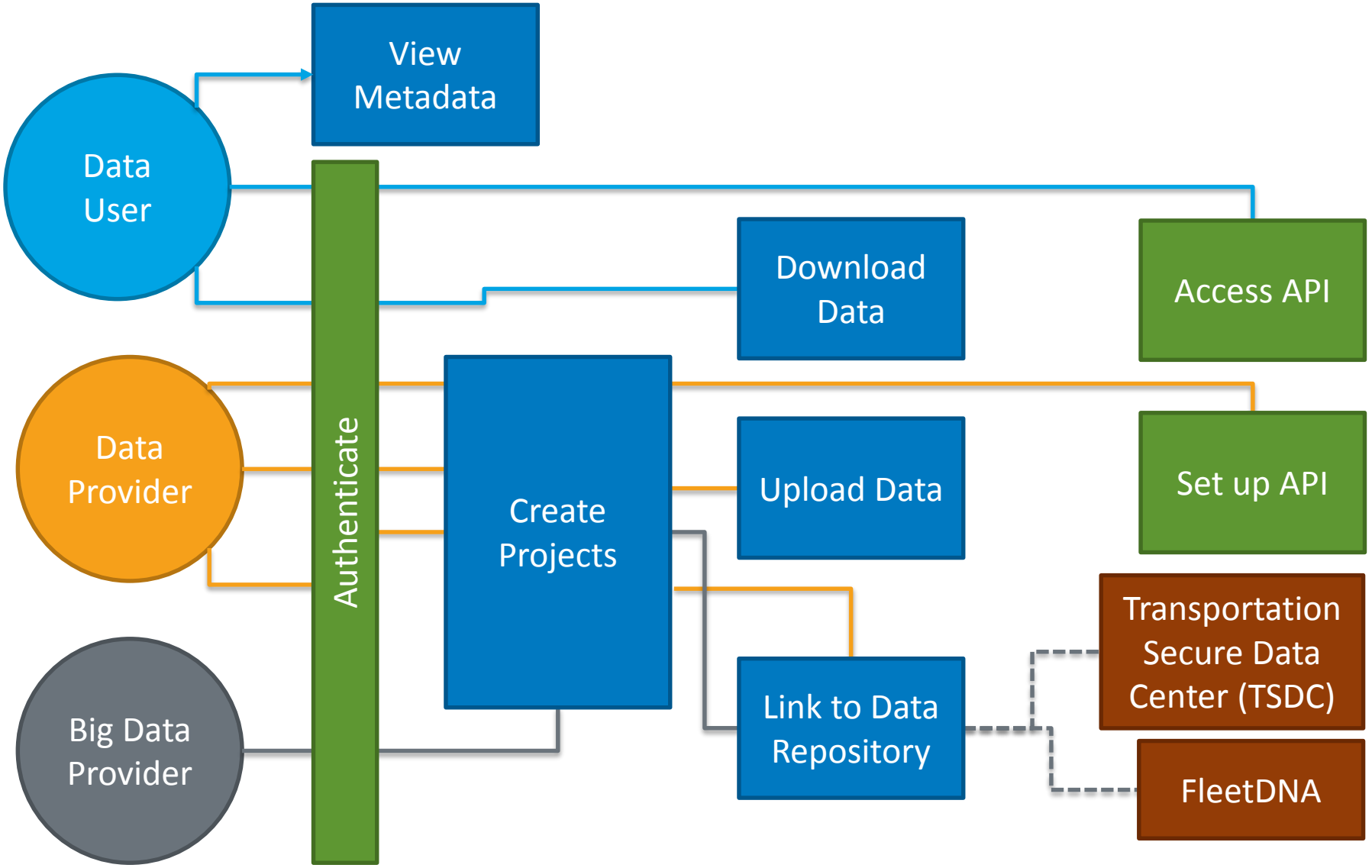




api.data.gov



Approach – Livewire Data Platform Capabilities



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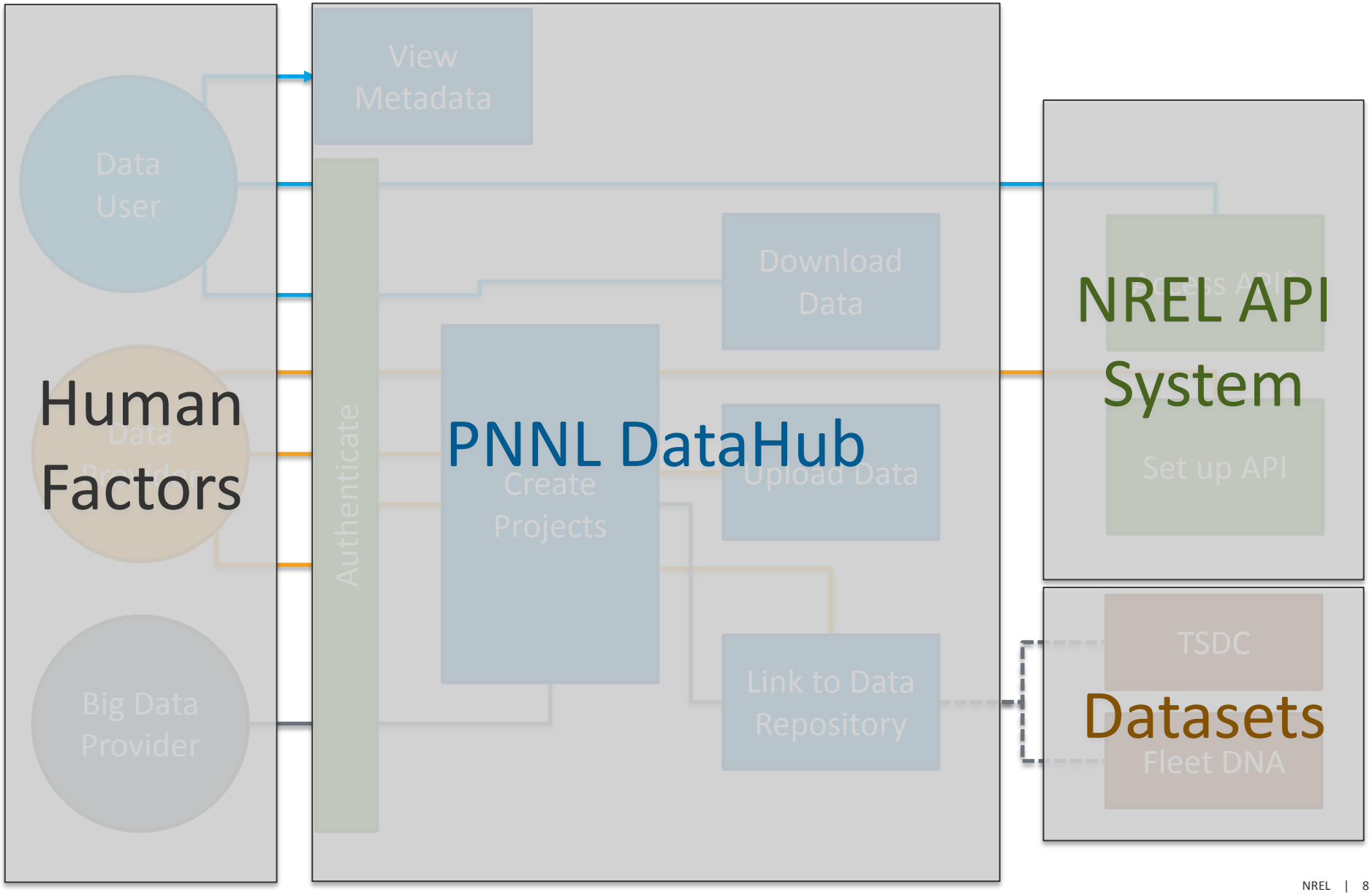

Approach – Livewire Data Platform Tasks

PROJECT APPROACH, TASKS & BUDGET

Task	Description	Partner Name
1	Create data management platform and expose datasets	
1.1	Develop DataHUB	PNNL
1.2	Develop API Platform	NREL
1.3	Provide QA for datasets	INL
1.4	Provide Data to Livewire	NREL, INL & EEMS partners
2	Build complex-data management capabilities	
2.1	Evaluate and gather EEMS data needs	NREL & INL
2.2	Maintain and share FleetDNA data	NREL
2.3	Maintain and share TSDC data	NREL
2.4	Evaluate complex EEMS datasets to create data sharing heuristics and prototypes	NREL
3	Address human factors limiting data sharing and facilitate working group	NREL & INL
Total		

Grey rows indicate top-level task and sum of task and/or subtask budgets.

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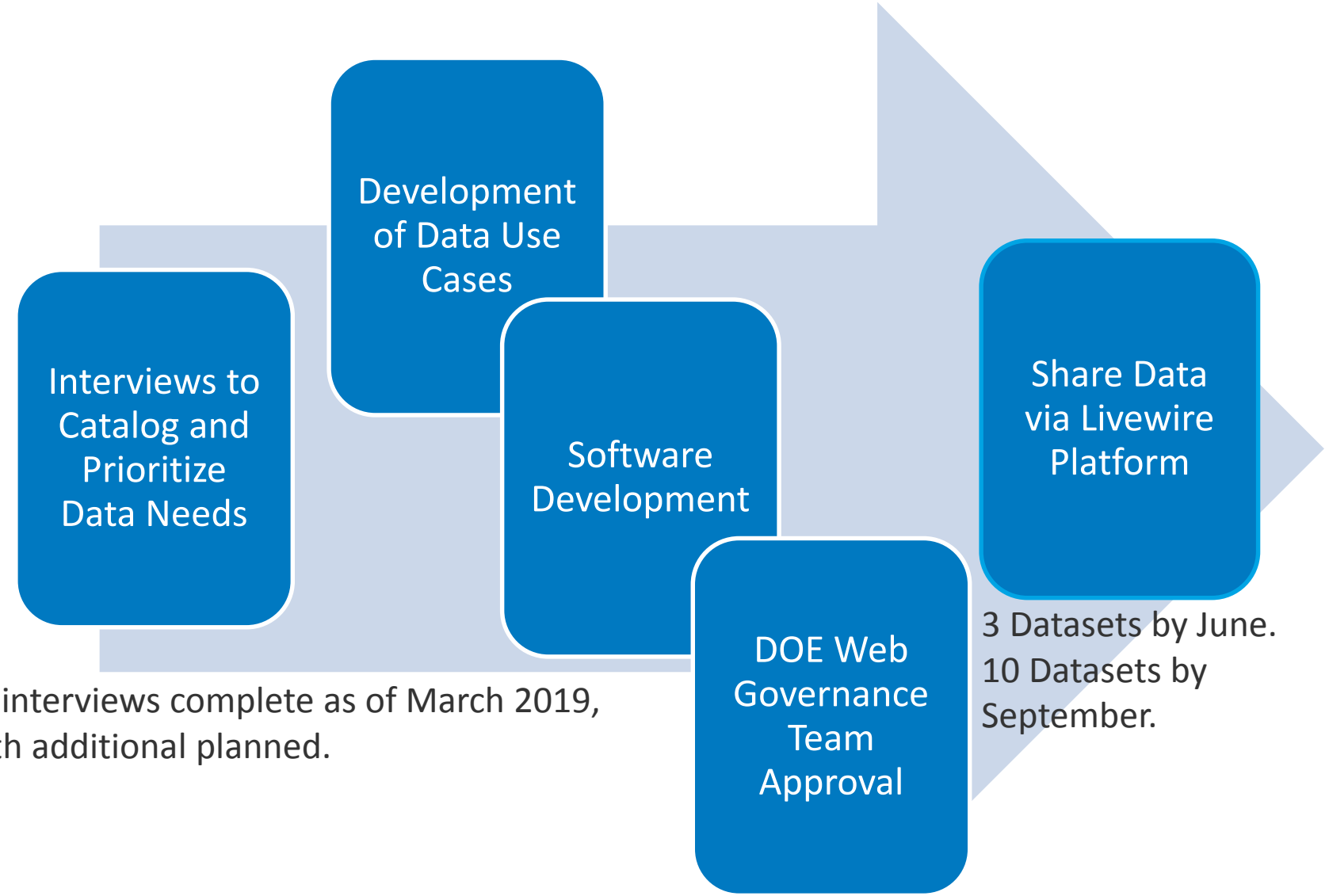
Accomplishment – Developed Plan

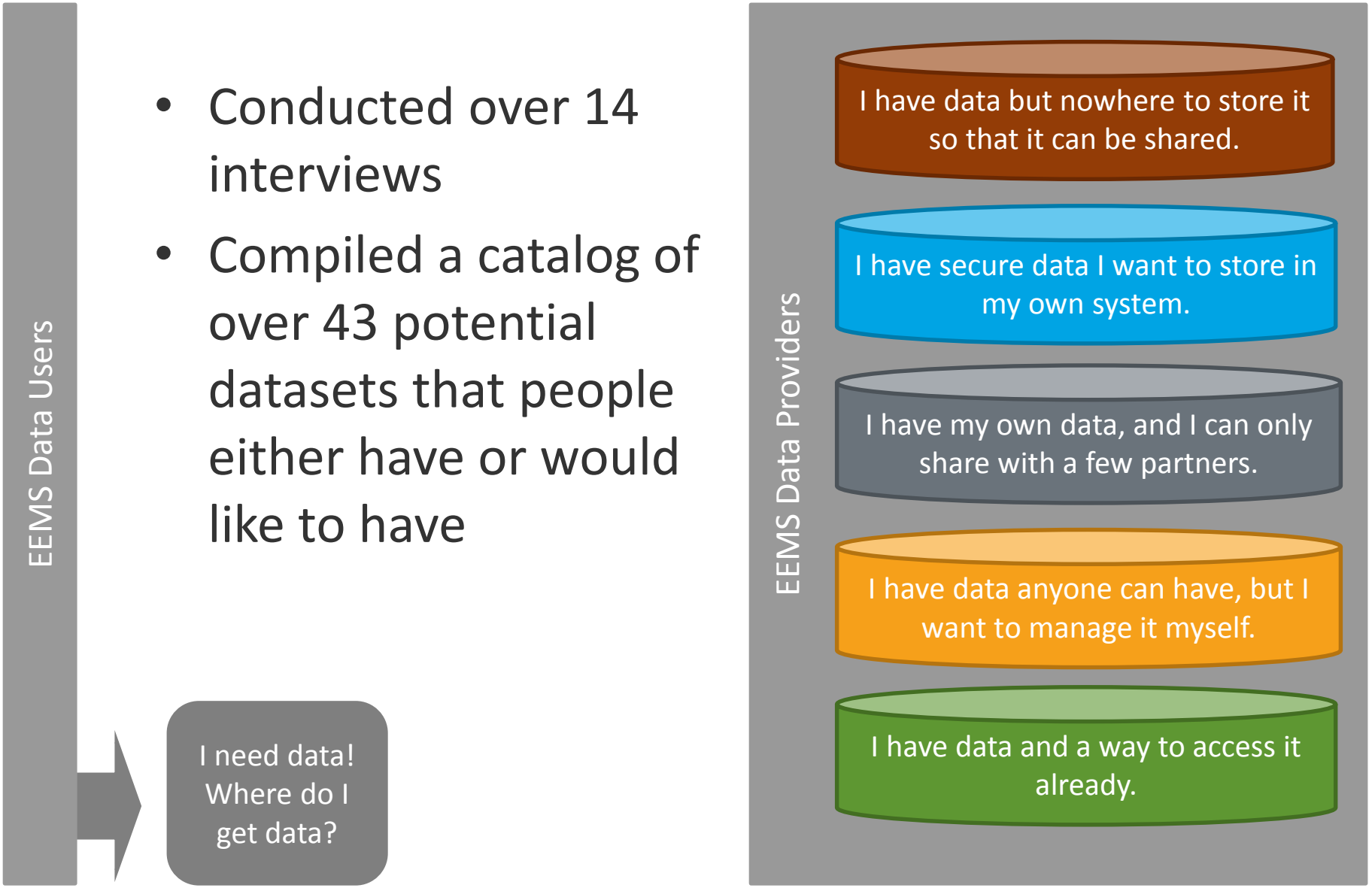


14 interviews complete as of March 2019, with additional planned.

3 Datasets by June.
10 Datasets by September.

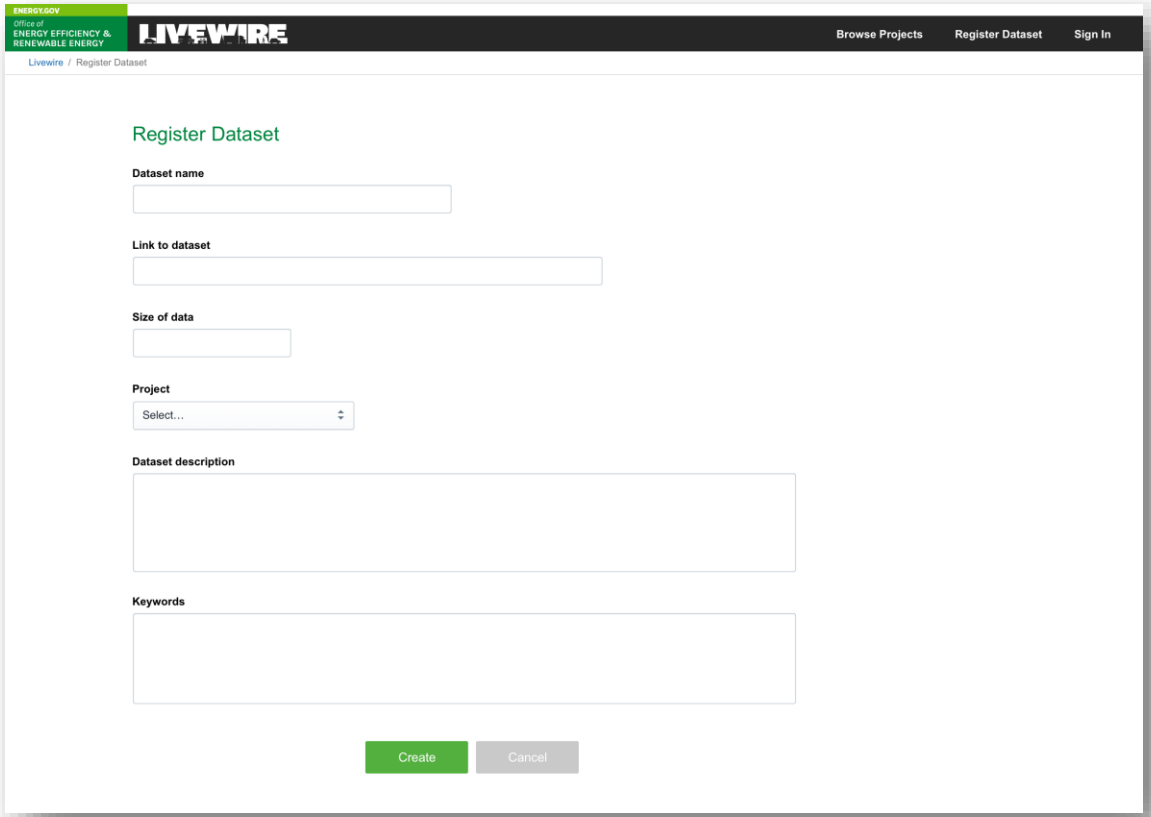
Accomplishment – Cataloged User Needs

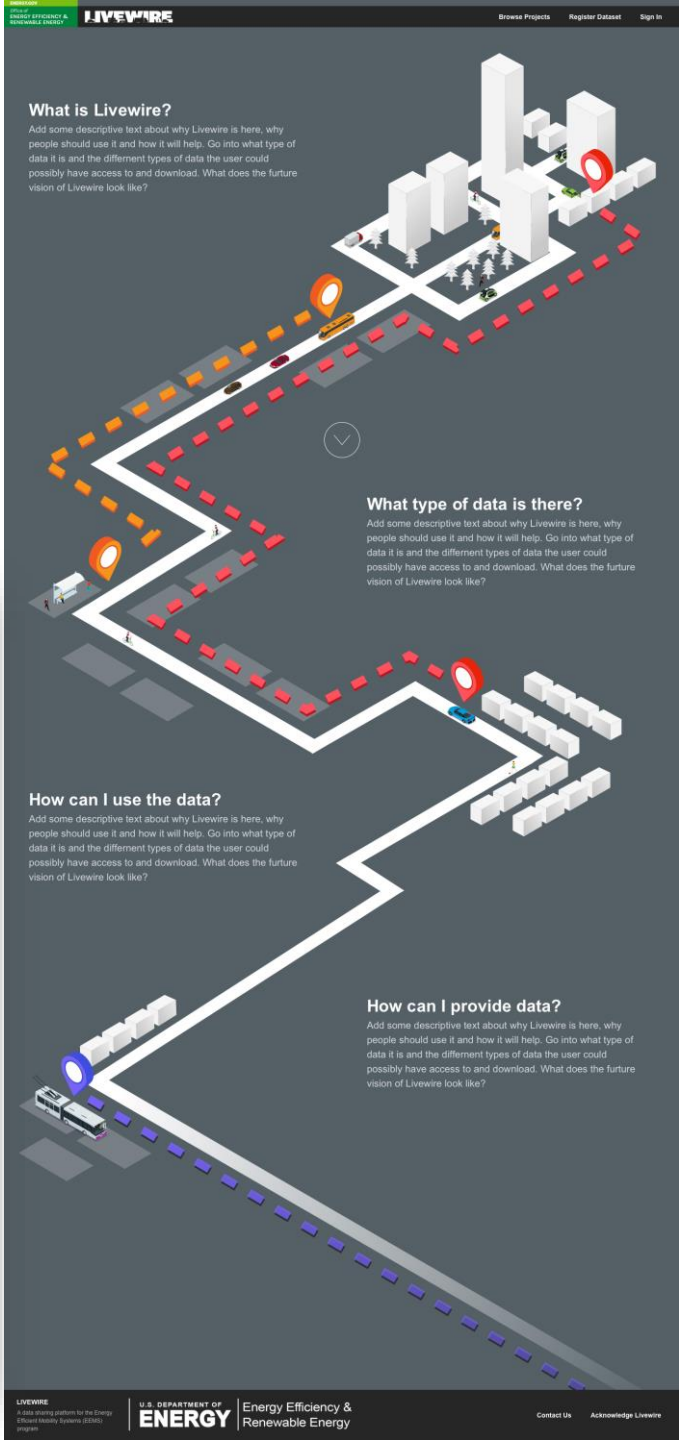
- Conducted over 14 interviews
- Compiled a catalog of over 43 potential datasets that people either have or would like to have



Accomplishment – Logo and Design

LIVEWIRE DATA PLATFORM





Accomplishment – Shared First Dataset

NREL Mobility Energy Productivity (MEP) Metric quantifies the energy and affordability aspects of travel

Use Case #1
User provides a location (address or latitude and longitude), and API provides the MEP score for that location

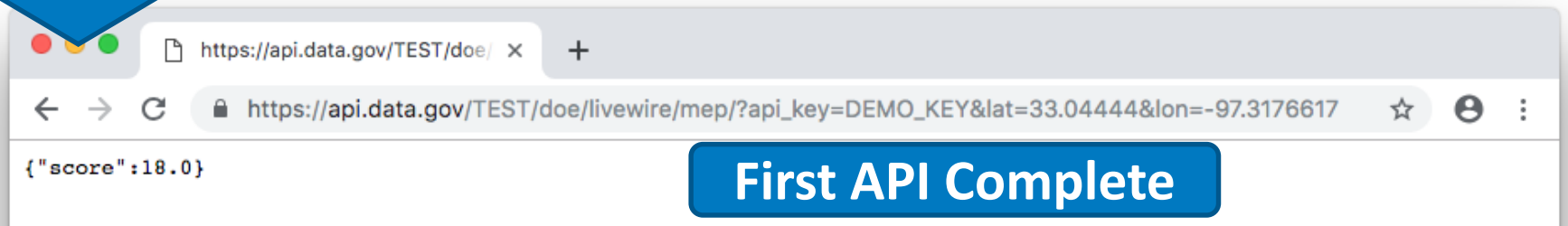
Use Case #2
User downloads a file of all the MEP scores for an entire city on a kilometer-by-kilometer basis

Use Case #3
User downloads isochrone map data showing distance that can be traveled by transit, car, bike, or foot in a given time period

Livewire website

Livewire API

Livewire datastore

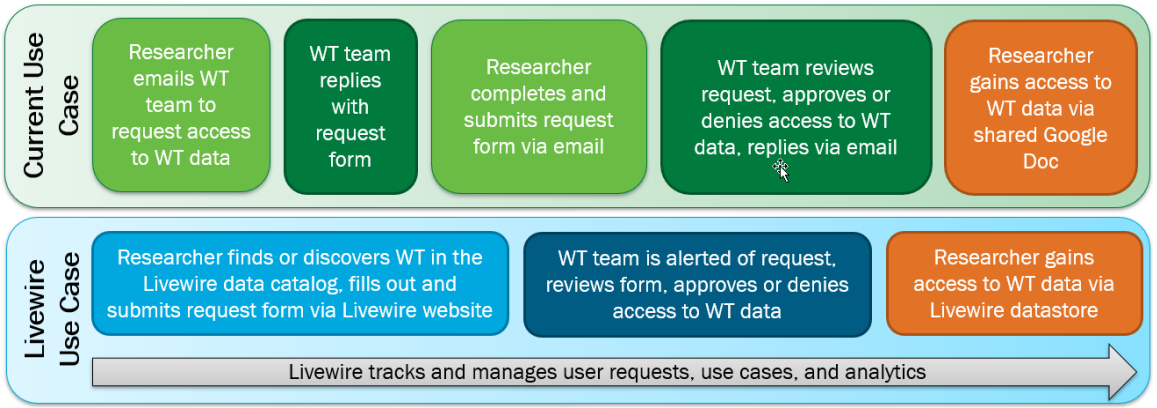


First API Complete

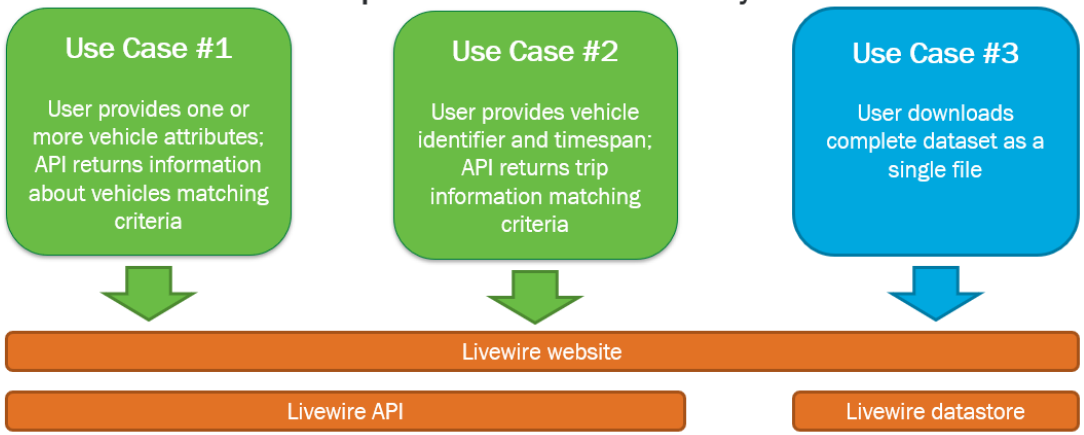
Accomplishment – Additional Shared Data

- Identified initial datasets for June release
  - MEP, Whole Traveler Survey, INL/University of Michigan (UMich) connected and automated vehicle (CAV) project
- Developing use cases for datasets that will be either hosted or linked to Livewire
- Explored researcher development stack options and decided on Amazon Web Service (AWS) Lambda/Chalice/ Python for initial API development and deployment

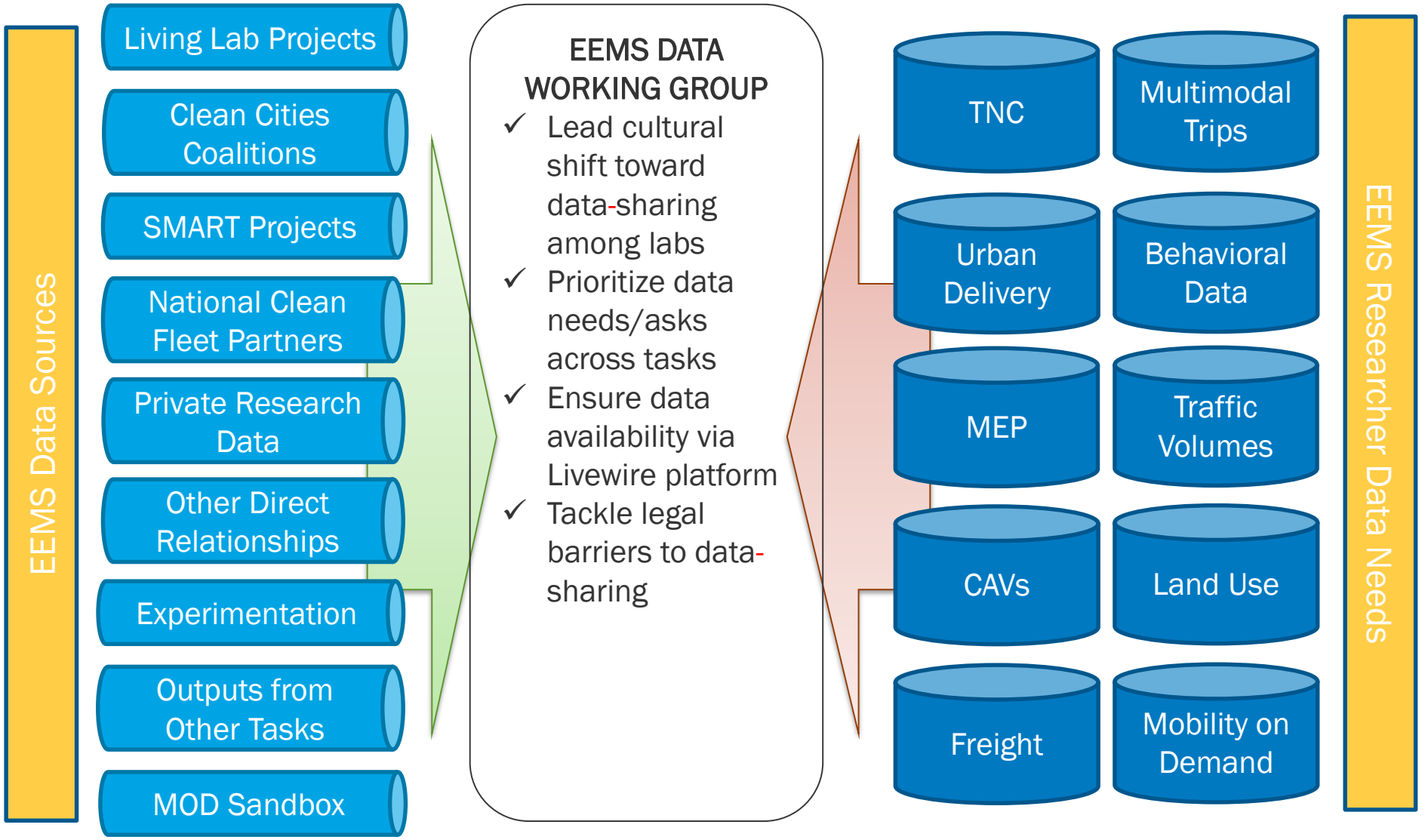
Whole Traveler survey data helps EEMS researchers understand travel choice patterns, preferences and decision-making processes with the advent of new mobility technologies



INL UMich Connected and Automated Vehicles (CAVs) dataset provides information about CAVs participating in study and time-based trip data for duration of study



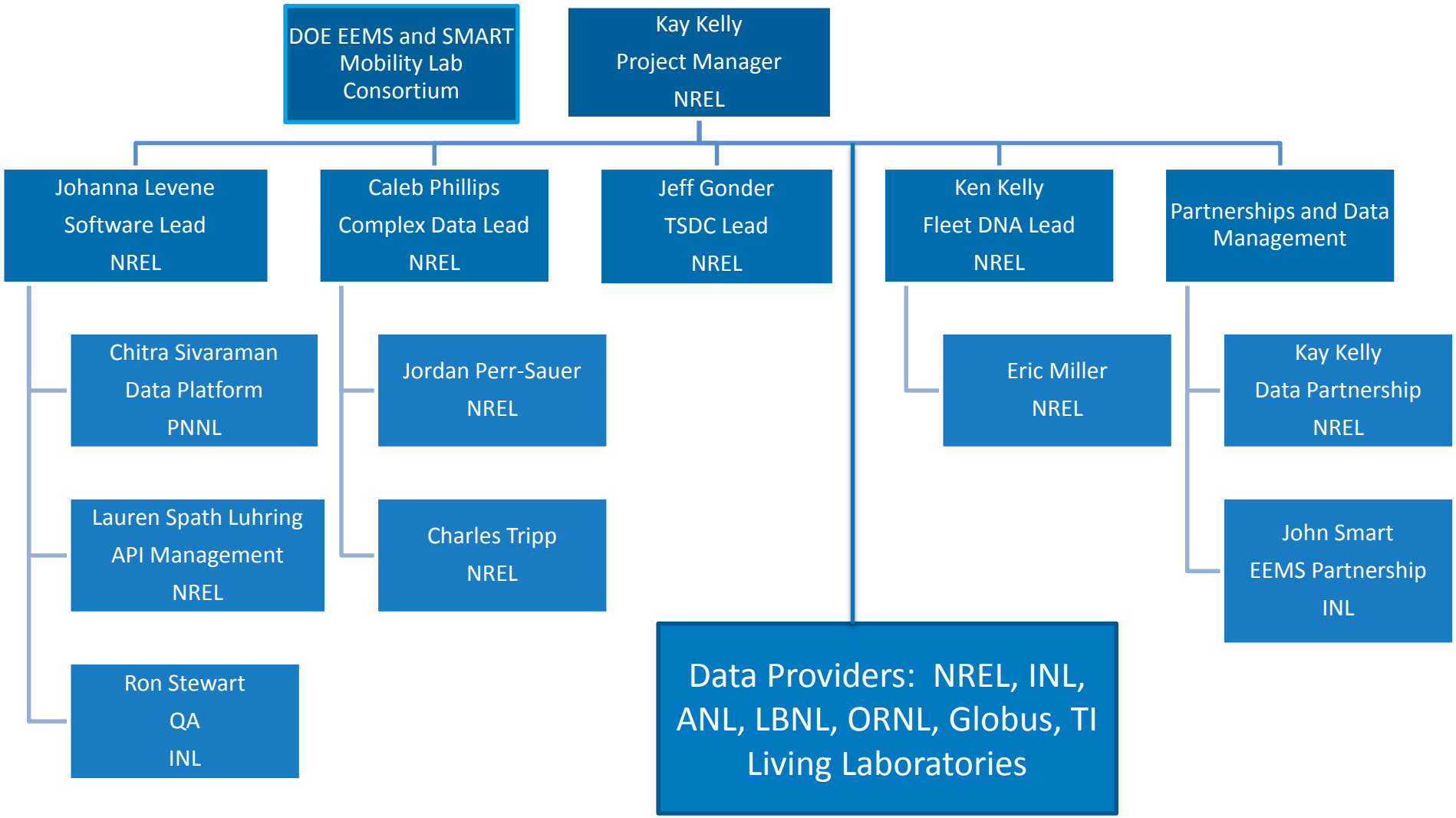
Accomplishment – Working Group



Responses to Previous Year Reviewers' Comments

This project was initiated in FY 19 and was not reviewed in previous years.

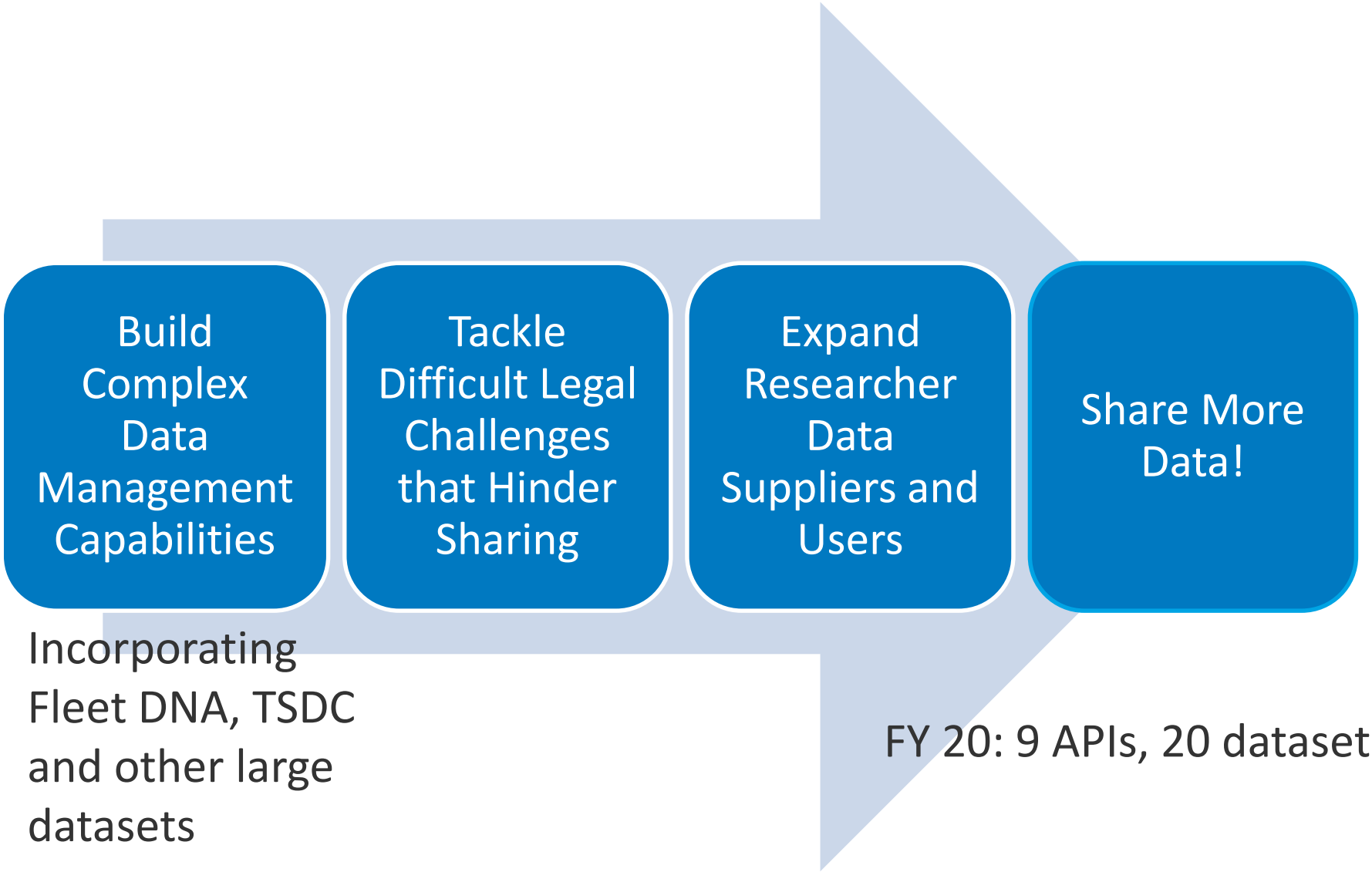
Collaboration and Coordination



Remaining Challenges and Barriers

- Although adept at scripting and familiar with using APIs, many researchers have never built an API and are unfamiliar with web technologies and need coaching and a simple platform to share data
- Large complex datasets, such as telematics and driver surveys, require expansion of the platform to effectively share data
- Legal challenges around non-disclosure agreements and licenses make sharing data difficult

Proposed Future Research Beyond FY 19



Any proposed future work is subject to change based on funding levels.

Summary

- Over 14 user interviews have validated that an EEMS data-sharing platform is needed
- A catalog of over 43 EEMS-relevant datasets have been identified
- By leveraging two existing successful platforms (https://a2e.energy.gov and https://api.data.gov), the Livewire Data Platform can be built efficiently
- Three datasets will be available by the end of June: MEP, Whole Traveler Survey, UMich CAVs Project
- Ten datasets will be available by the end of September
- Data will be protected behind an authentication process and usage of data will be gathered for both API and data downloads
- Involving researchers and partners in the development process aids in the reduction of human barriers to data-sharing

Thank You

www.nrel.gov

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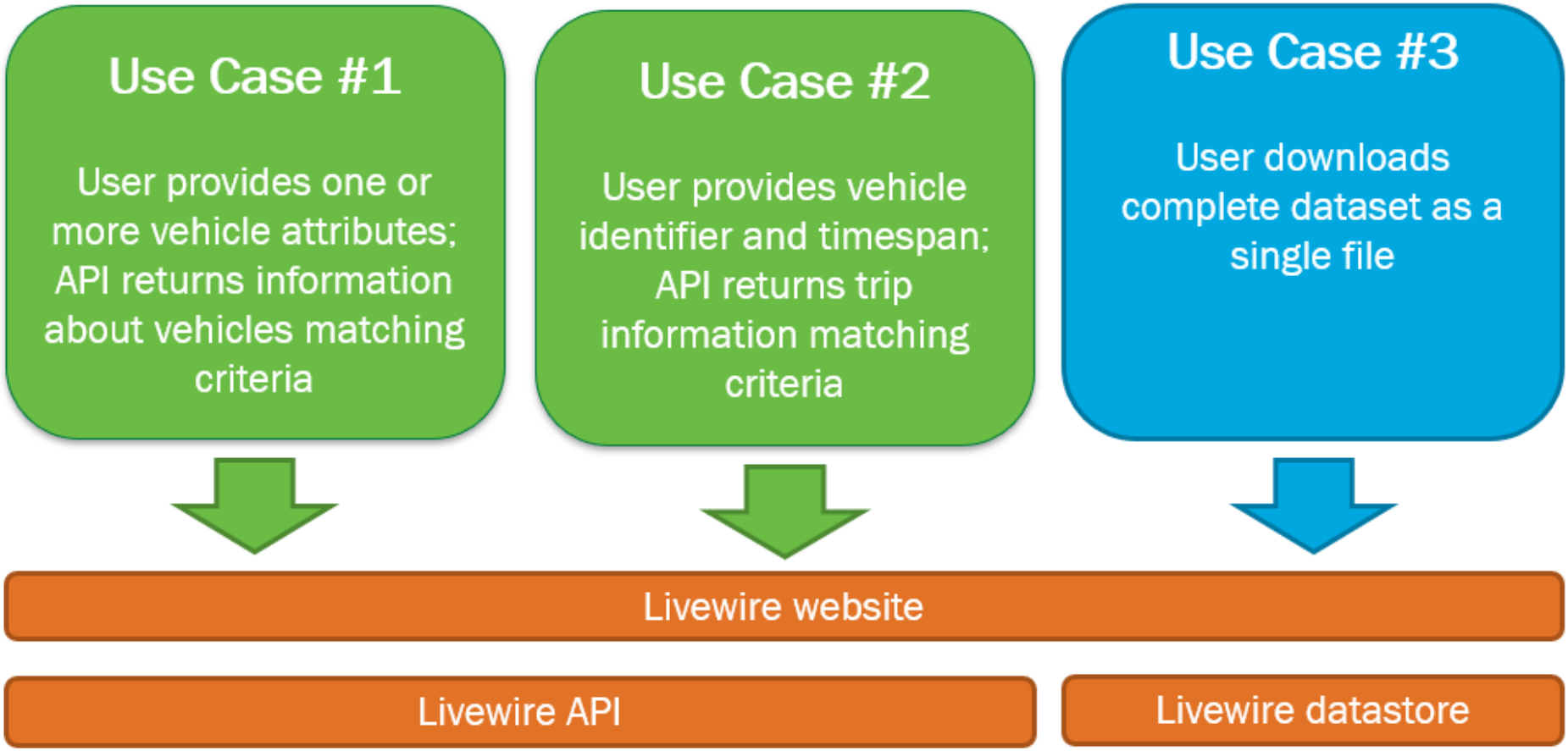
Technical Back-Up Slides

INL UMich CAVs Use Case

INL UMich CAVs dataset provides information about vehicles participating in study and time-based trip data



Whole Traveler Survey Use Case

Livewire Data Platform provides an easier method for sharing data, allowing researchers to spend time doing research and not managing data

Whole Traveler survey data helps EEMS researchers understand travel choice patterns, preferences and decision-making processes with the advent of new mobility technologies